

EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Example 1 (page 559)

Find the surface area of the sphere with the given diameter or radius. Leave your answer in terms of π .

1. $d = 30$ m
2. $r = 10$ in.
3. $d = 32$ mm
4. $r = 100$ yd

Find the surface area of each ball. Leave each answer in terms of π .

5.



$$d = 68 \text{ mm}$$

6.



$$d = 24 \text{ cm}$$

7.



$$d = 2\frac{3}{4} \text{ in.}$$

Example 2 (page 559)

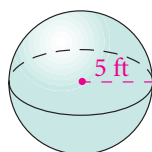
Use the given circumference to find the surface area of each spherical object. Round your answer to the nearest whole number.

8. a grapefruit with $C = 14$ cm
9. a bowling ball with $C = 27$ in.
10. a pincushion with $C = 8$ cm
11. a head of lettuce with $C = 22$ in.

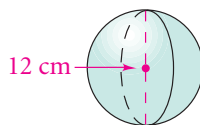
Example 3 (page 560)

Find the volume of each sphere. Give each answer in terms of π and rounded to the nearest cubic unit.

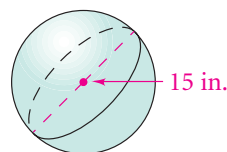
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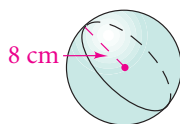
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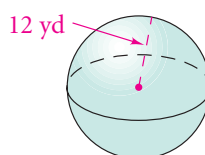
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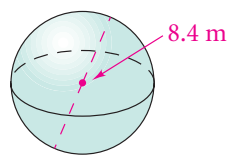
15.



16.



17.



Example 4 (page 560)

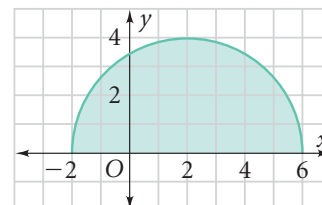
A sphere has the volume given. Find its surface area to the nearest whole number.

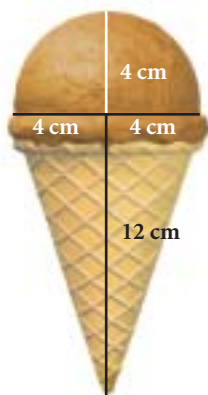
18. $V = 900 \text{ in.}^3$
19. $V = 3000 \text{ m}^3$
20. $V = 140 \text{ cm}^3$

B Apply Your Skills

21. **Mental Math** Use $\pi \approx 3$ to estimate the surface area and volume of a sphere with radius 3 cm.

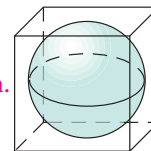
22. **Visualization** The region enclosed by the semicircle at the right is revolved completely about the x -axis.
 - a. Describe the solid of revolution that is formed.
 - b. Find its volume in terms of π .
 - c. Find its surface area in terms of π .





Exercise 23

23. **Food** A sphere of frozen yogurt was pressed into the cone as shown at the left. If the yogurt melts into the cone, would the cone overflow? Explain.
24. The sphere at the right fits snugly inside a cube with 6-in. edges.
- What is the radius of the sphere?
 - What is the volume of the space between the sphere and cube, to the nearest tenth?



Geometry in 3 Dimensions A sphere has center $(0, 0, 0)$ and radius 5.

25. Name the coordinates of six points on the sphere.
26. Tell whether each of the following points is inside, outside, or on the sphere.
 $A(0, -3, 4)$, $B(1, -1, -1)$, $C(4, -6, -10)$
27. **Meteorology** On September 3, 1970, a hailstone with diameter 5.6 in. fell at Coffeyville, Kansas. It weighed about 0.018 lb/in.^3 compared to the normal 0.033 lb/in.^3 for ice. About how heavy was this Kansas hailstone?
28. **Critical Thinking** Which is greater, the total volume of three spheres, each of which has diameter 3 in., or the volume of one sphere that has diameter 8 in.?

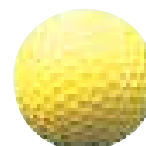
Find the volume in terms of π of each sphere with the given surface area.

- | | | | |
|--------------------------|---------------------------|-------------------------|---------------------------|
| 29. $4\pi \text{ m}^2$ | 30. $36\pi \text{ in.}^2$ | 31. $9\pi \text{ ft}^2$ | 32. $100\pi \text{ mm}^2$ |
| 33. $25\pi \text{ yd}^2$ | 34. $144\pi \text{ cm}^2$ | 35. 49 m^2 | 36. $225\pi \text{ mi}^2$ |

37. A balloon has a 14-in. diameter when it is fully inflated. Half of the air is let out of the balloon. Assume that the balloon is a sphere.
- Find the volume of the fully-inflated balloon in terms of π .
 - Find the volume of the half-inflated balloon in terms of π .
 - What is the diameter of the half-inflated balloon to the nearest inch?

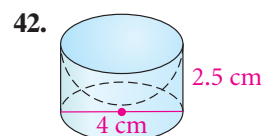
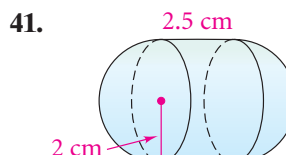
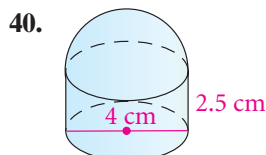


38. **Sports Equipment** The golf ball diameter is 1.68 in.
- Approximate the surface area of the golf ball.
 - Critical Thinking** Do you think that the value you found in part (a) is greater or less than the actual surface area of the golf ball? Explain.

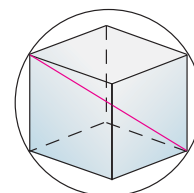


39. **Open-Ended** Give the dimensions of a cylinder and a sphere that have the same volume.

Find the surface area and volume of each figure.



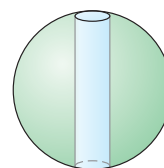
43. **Science** The density of steel is about 0.28 lb/in.^3 . Could you lift a solid steel ball with radius 4 in.? With radius 6 in.? Explain.
44. A cube with edges 6 in. long fits snugly inside the sphere. The diagonal of the cube is the diameter of the sphere.
- Find the length of the diagonal and the radius of the sphere. Leave your answers in simplest radical form.
 - What is the volume of the space between the sphere and the cube to the nearest tenth?



Challenge



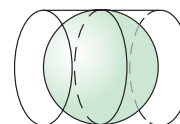
Graphing Calculator The sphere has a 10-cm radius. Of all the cylinders that fit snugly inside the sphere, such as the one shown here, find the dimensions of the one with the greatest measure indicated. (*Hint:* Use the Exploration on page 536.)



45. lateral area
46. volume
47. A plane intersects a sphere to form a circular cross section. The radius of the sphere is 17 cm and the plane comes to within 8 cm of the center. Draw a sketch and find the area of the cross section, to the nearest whole number.
48. Suppose a cube and a sphere have the same volume.
 - a. Which has the greater surface area? Explain.
 - b. **Writing** Explain why spheres are rarely used for packaging.

Find the radius of a sphere with the given property.

49. The number of square meters of surface area equals the number of cubic meters of volume.
50. The ratio of surface area in square meters to volume in cubic meters is 1 : 5.
51. **History** The sphere fits snugly inside the cylinder. Archimedes (c. 287–212 B.C.) asked that such a figure be put on his gravestone along with the ratio of their volumes, a finding that he regarded as his greatest. What is that ratio?



Standardized Test Prep

Reading Comprehension

Read the passage below, then answer Exercises 52–54 based on what is stated in the passage.

Believe It Or Not

J.C. Payne, a Texas farmer, is the world champion string collector. The ball of string he wound over a three-year period has a circumference of 41.5 ft. It weighs 13,000 lb.

Listed in the Guinness Book of World Records, the ball of string is now in a museum devoted to oddities. It took almost a dozen men with fork-lift trucks to load the ball onto a truck to move it there.



52. What is the radius of the ball of string to the nearest tenth of a foot?
A. 3.3 ft B. 6.6 ft C. 13.2 ft D. 20.75 ft
53. Which is the best approximation of the volume of the ball of string?
F. 300 ft^3 G. 600 ft^3 H. 1200 ft^3 I. 2400 ft^3
54. If Mr. Payne wound the same amount of string each year, which is the best estimate of the radius after one year?

Multiple Choice



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Short Response

A. 2.2 ft

B. 2.3 ft

C. 4.4 ft

D. 4.6 ft

55. What is the surface area of a sphere whose radius is 7.5 m?

F. $75\pi \text{ m}^2$

G. $112.5\pi \text{ m}^2$

H. $225\pi \text{ m}^2$

I. $562.5\pi \text{ m}^2$

56. What is the volume of a sphere whose radius is 6 ft?

A. $48\pi \text{ ft}^3$

B. $144\pi \text{ ft}^3$

C. $288\pi \text{ ft}^3$

D. $324\pi \text{ ft}^3$

57. The volume of a sphere is $26,244\pi \text{ cm}^3$. What is its surface area?

F. $1070\pi \text{ cm}^2$

G. $1402\pi \text{ cm}^2$

H. $2448\pi \text{ cm}^2$

I. $2916\pi \text{ cm}^2$

58. The surface area of a sphere is $576\pi \text{ in.}^2$. What is its diameter?

A. 1 ft

B. 1.7 ft

C. 2 ft

D. 3.5 ft

59. The surface area of a sphere is $36\pi \text{ ft}^2$.

a. What is the radius of the sphere? Show your work.

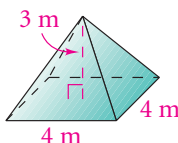
b. What is the volume of the sphere? Show your work.

Mixed Review

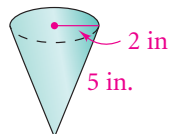
Lesson 10-6

Find the volume of each figure to the nearest cubic unit.

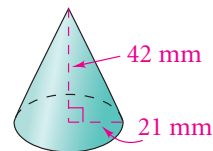
60.



61.



62.



Lesson 9-2

63. A leg of a right triangle measures 4 cm and the hypotenuse measures 7 cm. Find the measure of each acute angle of the triangle to the nearest degree.

64. The length of each side of a rhombus is 16. The longer diagonal has length 26. Find the measures of the angles of the rhombus to the nearest degree.

Lesson 8-6

The similarity ratio of a pair of similar isosceles trapezoids is 2 : 3.

A diagonal of the smaller figure has length 7 cm.

65. Find the length of a diagonal in the larger trapezoid.

66. The perimeter of the larger trapezoid is 40.5 cm. What is the perimeter of the smaller trapezoid?

67. The area of the smaller trapezoid is 30 cm^2 . What is the area of the larger trapezoid?